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ABSTRACT

The advent of anticipatory and boundary layer standards used in information technology standardization has created a need for a new base level theory that can be used to anticipate the problems that will be encountered in standards planning, creation, and implementation. To meet this need, a five-level model of standards has been developed. The model reflects the growing level of sophistication in information technology standards, and provides a basis for beginning to structure the environment in which standards planning and creation takes place. The text is supplemented by eight figures, which are replicated along with other overhead transparencies used during the presentation of the paper. (Author/EW)

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Title: A Five Stage Conceptual Model for Information Technology Standards

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Abstract: The advent of anticipatory and boundary layer standards used in Information Technology (IT) standardization has created a need for a new base level theory that can be used to anticipate the problems that will be encountered in standards planning, creation, and implementation. To meet this need, a five level model of standards has been developed. The model reflects the growing level of sophistication in IT standards and provides a basis for beginning to structure the environment in which standards planning and creation takes place.

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OVERVIEW:

The basic thesis of this paper is that Information Technology (IT) standards and standardization, as presently practiced, are performing in a bellwether role for the entire standardization process. This thesis is predicated upon empirical data, rather than upon systematic research. The model that this paper postulates for IT standardization process seems to be valid across an increasingly wide spectrum of other industrial standardization efforts, especially those that deal with high technology. The model is one that describes the needs and actions required to create an anticipatory marketing standard within the voluntary consensus process. The process, rather than the rules of the process, is the primary subject of the model. The gating item that impacts the model seems to be the impact of technological change upon the basic process being standardized; the higher the rate of technological change, the more applicable the model.

BACKGROUND and CONSTRAINTS:

This paper centers on *de jure* rather than *de facto* standards. *De facto* standards develop at the whim of the market - and are, by definition, market driven. (The entire process of acceptance of a *de facto* standard is a marketing study of how a single firm convinced the market that it had the solution.) *De jure* standards are also market driven - but have a defined creation. It is an analysis of the creation of *de facto* standards that is the basis for a large portion of this paper.

The paper depends upon the concept of the embedded observer for a valid description of the standardization process. The critical point here is the degree of universality and neutrality that the observer has in describing and drawing conclusions about the process. Because I work for the Corporate Standards group within Digital Equipment Corporation, I have reasonably wide access - both from internal and external sources - to what is perceived as happening to as well as in the process of standardization. Because I am not technical and, by choice, do not participate on the technical working groups, I have minimal formal bias towards a particular solution. My function within Digital is to act as the "Corporate philosopher" for standards, providing a theoretical and marketing basis for standardization and standards so that they can be understood and used by the corporation. By definition, this includes looking not so much at the outcome of the standardization process as the process itself, where the term "process" is used as an all inclusive description of

things that happen to create a standard.

It is important to note in the above paragraph the statement of ... "what is perceived as happening to and in the process...". Each individual sees the activity from a different perspective - because each individual can represent any of a number of points of view depending upon the time that the activity is occurring. Because the *de jure* process requires committee activity, and because these committees operate in native language with these individuals with non-specific motivation, there is an inability to clearly state what actually happened in any situation. There is only the ability to state that there is consensus that something happened, and that the standard is the outcome of the activity of the committee. Based upon this observation, I would tend to favor an approach to the practice of standardization which sees standardization as based upon small group psychology, combined with an awareness of business and technology.

Traditionally, standards have been viewed as a method of describing a product or process to allow replication and to give assurance that the result of the replication is valid. This definition, while convoluted, applies equally well to coinage as it does to screw sizes and distillation. A key to this definition, however, is that it applies, in the main, to products and processes that are known and established. Standards are reactive, usually being used to quantify an offering that is available. The reason for the standard is to encourage use of the product or service being standardized, so that users know that what they have is, in fact, what they thought that they had. Standards allow the user of a product the ability to anticipate a certain level of performance or activity about that product by providing a comparison metric. It is this comparison metric that validates the use of the standard and provides a rationale for the existence of standards.

Basically, standards serve commerce by facilitating the interchange of goods and services. Money is an essential standard - an abstraction that is deceptively simple yet which ultimately forms the basis of society, allowing translation of non-similar products into common standardized terms. While advances in standardization have occurred after the abstraction of standardized interchange units, I believe that these have merely been improvements in the sophistication of application, and not in the basic theory.

Standards are created within the bounds of a technical society - since standards and the acceptance and use of standards are a major underpinning of a technical and or commercial society. However, with this commercial/technological base comes the acceptance of the scientific method - rational

expectations based upon quantification of problems and activities. The creation of standards is usually the work of a technologically competent portion of the society - who are themselves steeped in the scientific method. To facilitate the development of these technical standards, organizations have been created - within the *de jure* process - called Standards Developing Organization (SDO). SDOs operate under a defined set of rules called, for this paper, the "standards process". These rules are a codification of how the process to achieve consensus must be reached, and detail the steps necessary to achieve this consensus, as well as stating how to tell when there is consensus. Once consensus is achieved (somewhat akin to achieving nirvana) the standard can be published. The "standards process" deals only with the rules - and is the justification for the structure of the SDO. In reality, the SDO adds nothing to a standard, other than acting as the keeper of the process. The actual creation of the standards is the responsibility of the participants of the process, and understanding the participants is key to understanding how and why the process occurs.

The technologically competent usually participate in the standards process. These technologists, using their rigorous technical training and the scientific method, create standards. The methodology is the description of a problem, creation of a method of gaining information about that problem, finding information (also known as facts), ordering of the facts to establish whether or not they apply to the problem, and the discovery of a viable solution to a problem based upon these facts. This is all well and good - as far as it is applicable.

However, if the earlier comments about the nature of a standards participant are valid, the creation of standards is essentially a study in small group psychology, based upon individual needs and desires which operate in the arena of a semi-formal process. Because of this, it is not necessarily predictable at the micro-level; that is, there are too many random variables which cannot be known until after they have surfaced and the action that they impel completed.

The question then becomes one of what can be legitimately postulated about standards and the standards process. If standards are examined at a level in which the particular actions of the participants are ignored, but the arena of possible action is defined, then there is a better chance for the creation of a model that is both useful and slightly predictive. It will not be predictive as to what the outcome of a process will be at the inception of the process, but rather will be predictive of the activities that will occur and where possible intervention points may be. This knowledge of intervention points will not necessarily help in predicting the future, but it can help in trying to participate in the activities that will impact the future. That is the intent of this

model. By indicating how the process occurs and what the process seems to require to function successfully, it may be possible to determine where there are intervention points that are usable to guide the process - in a general way - to a more successful and usable conclusion.

THE PROCESS OF STANDARDS CREATION

The present Information Technology (IT) standardization process - that is, the process in the United States by which voluntary consensus standards are created - is predicated upon the concept that practitioners and users of a discipline and skill are better qualified to create a standard relating to that skill or discipline than are those who are only peripherally involved. This bias is not native to the IT process, but rather is native to the U.S. standardization effort. The U.S. process is completely voluntary, and the dominant feature in the process is the American National Standards Institute (ANSI), a quasi-official body which acts as the keeper of the consensus standards process within the U.S. The consensus process, as noted above, relies upon the idea of the "consent of the governed" for the creation of standards. There is no central planning, other than that which is achieved by the market. Voluntary standards come into being and are accepted only in so far as they meet a need in the market - and only as long as they serve a function in the market. It is the ability of the process to meet these market needs that forms the first section of this paper.

The standards process, as it is generally described, details the rules for actually writing a standard, balloting that standard, and then having it approved. This description is what I feel are the "rules of the process", not the process. The actual *process of standards creation* begins much earlier, and consists of five steps. These five steps are:

Preconceptualization
The Formal Standards Process
    Conceptualization
    Discussion
    Writing the Standard
Implementing the Standard

The five steps break into three stages of unequal length, but of equal importance. Each step must be completed before the next step can be entered. Skipping steps is, I believe, impossible. Each

stage anticipates the next stage, telegraphing the intent of the process so that there is an anticipation of future activity. I would like to now turn to an examination of these five steps.

The first step is one that occurs constantly. It is not unique to the standards process, but rather to the nature of business. This stage is also referred to as the "blue sky" or "wild duck" stage, and is the place where innovation begins. (Because of the high mortality rate in this stage - both of ideas and promoters of these ideas, I tend to refer to this stage as the "martyr stage".) It is in this stage that a proponent of an idea first comes to believe that there is a potential for having a solution standardized. Usually, this is an individual or team of individuals who really believe that they have a good idea. The first hurdle is determining if there is support within an immediate group for the idea. If there is no support, then the concept either must be restated or must be dropped. If there is a continuation, a support base must be created. The creation of this support base is one of the critical features of the standardization process. The base must extend outside of the immediate potential users of the proposed standard; if it is a solution of only limited interest, or of limited acceptability, there really is no need to make it a national standard, since it will not serve a truly national audience. Current IT standards are not necessarily point solutions to immediate problems. Additionally, the standard being proposed must work within the bounds of practical technology - or technology that the market can use. While ideas that rely upon leaps in technology are not uncommon, concepts that are being proposed for standardization need to use implemented or only slightly advanced technology. Finally, the proposed solution should not overwhelm the problem for which it is being offered as a solution; that is, the problem must be worthy of the solution. Also, there must be an examination of the nature of the problem that called for the proposed standard; if it has characteristics of a transient problem, a problem that stems from a misapplication or misunderstanding, or a problem that is chronic, it probably is not capable of being dealt with by a standard.

The preconceptualization stage continues until the proposal is formally submitted to a Standards Developing Organization (SDO) or until the proposal dies. If the proposal makes it to an SDO, then the formal process of standardization can begin.

The first step of the formal process is the Conceptualization phase. It is in this phase that the concept is given its first formal structured review by an organization that is charged with creating a standard. It is in this phase that the SDO examines the idea to see if it has potential merit as a standard, if it can be standardized (that is, lies within the capability of technology to

implement), solves a real problem, and has a degree of economic viability. At the same time, the SDO reviews the proposal to insure that there is not a jurisdictional problem with the proposal - that is, that the proposed standard falls within the expertise of the SDO. The SDO that has an area of expertise on LANS will not, usually, develop a high speed disk interface. While this appears to be a trivial matter, because of the interchangeability of some technologies, it is very possible that a jurisdictional dispute can and will occur when a proposal is novel or applicable to several facets of the larger IT model.

Once the proposal is accepted, the item will be rigorously described, and a call for volunteers to work on the committee initiated. If no one comes to the committee to work on the proposal, the proposal will die - and the originator will have a good idea that the industry or market doesn't care. It is here that the first application of the concept of consensus is felt. When the call for volunteers is made, there is no attempt to disguise the call. Anyone who has an interest can attend these meetings. The only qualification is that the person be interested enough to attend and to contribute to the work of the committee. And it is here that both the proponents and opponents of the standard begin to gather. This is a difficult time for the originator.

The second stage of the formal process is the discussion stage. This is the stage that is frequently criticized as taking too long to occur in the standards process - and it is the stage that can take up to a year to sort out. It is, however, one of the more important stages, for in this stage the concept is fleshed out, generalized, and made part of the current IT environment. It is in this stage that the proposed standard is subjected to business concerns, ie, the impact on the installed base, who can and will support a standard, what is necessary to insure that the standard, when produced, will be implemented? It is here the first direct influence of the market is felt, since the committee chair and vice-chair have to insure that someone will use the standard once it is produced. If a committee works long and hard on a standard only to find that no producer will use it, the work is largely worthless. So, these discussions take place in the discussion stage. The organization of the committee takes place - and a definition of the goal. This is the planning stage for many standards, where the intent of the standard is decided upon and a methodology for achieving successful completion defined.

Finally, when all of this is completed, the committee is ready to go to work writing the standard. It is this is aspect of standards with which most people are familiar. It is the time when a technical idea is translated into native language - in a manner that provides a non-ambiguous

interpretation of the designers intent. The standard must be written in a way that allows multiple implementations of the standard and but a single interpretation of the language of the standard. It is also where the consensus process becomes important, since it is here that the checks and balances begin to take hold - insuring that there is consensus, but with the potential of slowing the process down. Because of the multiple review cycles and rewrites built into the process, the writing of a standard can seem to stretch forever. However, eventually, the process will end, and a standard will be named, and the appellation of American National Standard will be assigned.

With the completion of this stage, most participants leave, feeling that they have done their duty. However, there is the final stage, before which all is prelude. The implementation of the standard is the payback period for the work done in the committee - that is, it is here that the value of the standard becomes real. A standard that is written for the sake of being printed serves no one, except the publishers. There must be a demand for the standard - either on the part of the providers or on the part of the users.

Providers will implement a standard when there is a reason - and only when there is a reason. The reason usually is quantified in terms of market acceptance or market growth - or some other financial metric. The user will ask for a standard when there is obvious advantage to using the standard; otherwise, the user is paying for features that are not necessary. However, because the users and providers have different criteria for use of a standard, there is natural tension that enters the process at this point - and this tension is based upon the nature of IT standards themselves.

ANTICIPATORY IT STANDARDS - THE NEXT WAVE

In the past, standards have been based upon a relatively simple model. The model basically took an existing product or service, analyzed it for applicability, and then described it is a way that was capable of replication. There is a reactive nature to this model, in that there needs to be an existing "thing" that is described in the standard. Usually, the thing being described was known to the industry that was standardizing it, and there were few hidden implications.

The implications of a standard are essential to understanding the power of a standard. The case that comes to mind quickly is the case for a broad and heavy flint spearhead, in contrast to a

smaller lighter spearhead made from bone or antler. Within three generations of a technical decision to use a flint spearhead in a cave tribe, there was an entire way of life that was caused, in large part, by the acceptance of that technology. The hunting patterns, the game, and dietary patterns, the living patterns - all of the metrics for leadership and survival - would emphasize an aspect that would have been different had another type of weapon been adopted. But, there would be little realization that the choice of technology to craft a spearhead would make that much difference.

It is this aspect of standardization - the implications and the necessity for planning - that forms the basis for understanding the nature of IT standardization as it is practiced today. A basic assumption here is that there is an understanding that standards are not a technical exercise but a marketing activity. In order to make this assumption, it is necessary to understand that voluntary consensus standards - de jure standards developed by the IT SDOs - are developed not because there is a regulatory need, but rather because there is a market need. In response to a perceived need, a standard is created. The standard can follow any one of three general strategies - that is, a strategy of congruence, planned change, or unplanned change, also occasionally referred to a chaos. The first two strategies are relatively straightforward; in the first, there is a need to be backwards compatible, or to respect an installed base. Changes made here are usually evolutionary, rather than revolutionary. COBOL is a standard that is now in the congruence stage, where the emphasis is not on changing COBOL, but rather improving it to preclude obsolescence on one hand and incompatibility on the other. In the case of planned change, there is a definite decision made to change the way that the market thinks about an operation. The case here would be the creation of a LAN as a method of rethinking the early arguments about where the power in a system would reside. A LAN makes the argument pointless, since it provides an alternative way of contemplating the entire scenario. It is the strategy of planned change that the implications of a standard are considered. It is the consideration of implications and the resulting restructuring of the market based upon a standard that allows many companies to gain market share - especially if they are the first to capitalize upon a standard. The mechanics of this are somewhat tenuous and are, I believe, based more upon circumstances more than upon formal planning. Exploitation of a standard for marketing gain is even less an exact science than new product marketing.

A strategy of unplanned change tends to be somewhat of an oxymoron. Unplanned change in standardization is usually begun as planned change - but the originators of a standards proposal did not see either far enough or clearly enough into the future. Standardization activities of this

type can be extremely dangerous - or they can prompt innovation and create entirely new areas for competition and growth. It is where innovation has its greatest opportunity - but also where the industry is at greatest risk.

Another point that is necessary to consider is the collapse of the IT product life cycle. In the 1960's, an IT product had a life expectancy of about 6 to 8 years, where the provider could hope to regain investment. This has changed over the past decade, and the life expectancy of a product is now about 3 to 5 years. This limits the time that one has to regain investment.

To stretch the life cycle, as well as to reduce costs, more and more providers are looking to the standardization process and standards as substitutes for the initial phases of life cycle. Products are derived from standards - or standardized components of products are used for their ability to increase the longevity of a product. In either case, there is an increasing reliance upon the standards arena for validation of product ideas and as a source for ideas or concepts which can extend the life of a product, allowing an increase in lifetime revenue.

All of this lead to a major point in consideration of IT standards - that is, IT standards are market driven standards (not unusual) which anticipate the marketing of a product or service by a provider. The IT industry is moving, in many cases, to what I call anticipatory standards - that is, standards that anticipate the actual creation of a product, and which are used to define a market, with all of the attendant implications of that market. In normal standardization schemes (that is, product standardization), the implications of the "thing" being standardized do not need to be considered, since they are already known. This is due, in part, to the nature of the standardization process, which operates from a concrete object to an abstraction of that object for the standardization. *IT standards, especially those that are anticipatory, however, operate from the abstract to the concrete, in that they describe systems that have not yet come into existence in other than model or conceptual form.* It is this aspect of IT standards that makes them highly unusual. In several cases, the standardization effort is occurring on a worldwide basis, in dozens of independent committees, who are working from only a "vaguely right" approach to what should be standardized. The effort, therefore, is to create a systems standard that describes the way that things should interoperate if they are ever created. In effect, standards have moved from a reactive role in IT to a proactive role, and have become industry change agents, carrying both the users and providers with them as they reshape an industry. (I do not believe that they are singular change agents, or that they operate without regard to other change agents in the industry. However,

they have moved from a practice that was used to record a product or process to a practice that is used to predicate how a product or process will be achieved.)

Because these standards are moving into the anticipatory phase and the standards are becoming the precursors of both the market and the products that will meet the market demand, there is an increase in the time that it takes to reach consensus. By implication this means that the time that it takes to produce a standard will also increase. Simultaneously, there is an increasing interest in standards by providers, who are the primary force behind standards in the United States. The providers have realized that standards can be used as marketing tools, and there is increasing emphasis on participation and ensuring that the standard produced does not preclude participation in the market by the various providers.

There is, however, a problem with viewing standards as a marketing tool. Because these standards are anticipatory, and because they are market focused and market driven, there is no method of predicting which standard will succeed - or even how a provider or user can anticipate that the next standard will be the correct standard. More importantly, there appears now to be a "confusion of standards", in which each segment of the market, from providers to users, has created its own "standard" and is encouraging adoption of only the standards that it has produced. This leads to a problem of too many standards, too many implementations, and too many choices.

This "confusion of standards" has lead to a creation of a five stage life cycle model that can be used for providing some basis for understanding the dynamics of the standardization process as it is practiced on a worldwide basis.

THE FIVE STAGE MODEL

The five stage model is an attempt to describe the creation of standards as they are presently occurring in the information technology industry. It is a model which I feel can be used in most high technology/high change industries. The assumption that underlies the model is that the industry being modeled uses standards as a change agent, to structure the use of technologies to move the market. This assumption indicates that the model is probably not valid for very young industries - that is, industries that have no installed base - and is also probably not valid for industries that are heavily regulated, since regulation is not the same as standardization.

The model is based upon concepts and ideas of Don Loughry of Hewlett-Packard, Joe DeBlasi of IBM, Frank Sauer of Apple Computer, and the author. At one time or another, over the summer of 1988, all of these people looked at the standards process and where a model was applicable, made significant contributions. Don Loughry contributed a horizontal three stage model that complemented my original three stage vertical model. Joe DeBlasi postulated five steps to the process, and Frank Sauer and I took that and created the current five stage model. Once the model was in place, it became necessary to provide the rationale for it - and this activity has been left to me. I gratefully acknowledge the help of the Strategic Planning Committee (SPC) of X3 in this work; the first introduction of the model to this committee in mid-summer in 1988 nearly marked the demise of the entire model; the contribution of Judy Fincher of Honeywell-Bull to reviving the model must be noted.

The current model (Figure 1) available to the industry is one that is predicated upon a reasonably simple two stage approach to the standards process. This approach, in turn, is predicated upon the earlier and simpler model of standards as a reactive force - that is, specifying something that already existed. It served the IT industry well through the 1970s, when the model became less and less applicable due to the changing nature of the industry.

The change in the industry that drove the model was the need for interconnectability - or, to phrase it another way, vendor independence. In the 1970s, OEMs became an increasingly important part of the IT industry. As the role of these resellers of equipment grew, their ability to compete with manufacturers depended upon their ability to provide solutions that the manufacturers could not. In many cases, this was a software solution that was a niche application. However, on occasion, the OEMs survived by providing a system that was the equivalent of the original providers, but at a lower cost. This need to sell for a lower cost drove many of them into the creation of heterogeneous systems, since they could not survive by reselling a manufacturer's complete system for less than the manufacturer could. This need for heterogeneous systems created a need for interoperability from a hardware point of view. At the same time, the growth of plug compatible computers offered another solution to the same problem - that is, retention of software. Finally, as computers grew in importance, many users began to feel that they were being taken advantage of by major vendors - and there was a demand that systems be "open systems". (This is an immensely simplified account of what happened. The injection of telecommunications into the world of IT, the break-up of AT&T, the dismissal of the case against IBM, the market acceptance and use of networked mini-computers, and finally the advent of the Personal Computer all played a part in driving the

THE WAY THAT IT USED TO BE

THE STANDARD

THE USE OF THE STANDARD

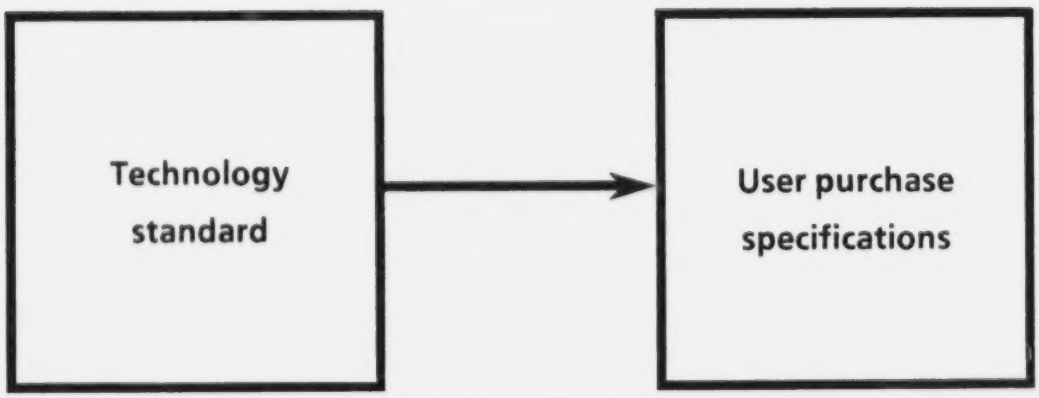


FIGURE 1

market in the direction of open systems.)

However, there was a question on how to achieve interconnectability. Obviously, the leading provider or providers could not supply the methodology, since this was exactly what they had been criticized for doing. As a result, standards were pressed into service to act as the method for achieving provider independence, since in a standards committee each provider and user had a single vote. It was democracy in action.

Two problems arose from this approach, however. One was the technical complexity of the interoperability concept. The other was the growth of the use of computing - especially in the late 1970s and the early 1980s. The growth in this area was not only growth in size, but was also growth in application and complexity of application. It was these two problem areas in the IT industry that have forced the change in the perception of standards. Standards - that is, the act of normalizing a thing or service - requires that the thing admit of standardization in its technology and application. In the 1970s and the 1980s - and continuing to the present - new applications for the technology and product/service of that technology appear each day. With each new application and each new technology, the older concept of a standard became a little more difficult to apply and a little more difficult to accept.

There were two forms of response to the growth that could happen - expansion of the standard to include more and more of the change (or) creation of more and more limited standards. Both approaches were tried simultaneously in the IT industry. Both worked - and the simultaneous implementation of both responses has almost been fatal to the standards program of the industry.

There can be little doubt that standardization in the IT industry is in crisis. The time to bring a standard through the formal process (Conceptualization, discussion, and writing) is approaching four years, which is too lengthy a period for standardize technology that changes every four years. At the same time, there has been a proliferation of standards developing organizations, both formal and informal, who represent the users, providers, interested parties, and the government. There are national organizations, international organizations, regional organizations, and multi-national organizations. All of these groups have separate interests and goals, but all claim to possess the true faith for standardization.

One of the reasons for this confusion of standards and standardization is that most of the

participants in the process still operate under the older two stage model - a created standard is an implementable standard. With an anticipatory standard, predicated upon establishing a market, this is not at all true or even necessarily germane. A standard may serve any of several functions - and all standards are not necessarily equal. As an example, a global standard, such as the Open Systems Interconnect (OSI) standard, describes in global terms the way that open systems should operate. However, it also specifies the complete spectrum of choices open to the market within its framework. It is obvious that no provider or user can or even would implement all of the options contained, yet these options must be contained within the standard to admit all of the possibilities of computing as it will be practiced when the standard is completed. (This approach to standardization reflects the global option - that is, inclusion of nearly all of the variability available in the market.)

At the same time, the user who implements the OSI model for a single company does not need and cannot use all of the options described in the global standard. Each option in the standard comes with a price - either in performance, system complexity, or system size. For the user, who is trying to buy an interoperating system that meets the business requirements, the global standard presents a problem. In order to make sense out of the model, the user will specify the parts of the OSI standard that are needed, as well as the parts of all of the other standards that are common to that particular user - from quality of design to portability of assets. The specification process is expensive, consuming expensive resources over time. In order to lessen the cost to each individual user, users will join together to provide common requirements documents for their industry - and call the collection of user documents a standard as well. (This is the individual multiple standard approach to IT standardization.)

There is one other phenomena that bears mentioning in the current state of IT standardization. This is the relative disappearance of the user from standards committees and relative lack of participation by users in accredited SDOs. As I stated earlier, the current formal process can take several years to complete, while the informal process (preconceptualization and implementation) can add several years to that time. Users rarely have the resource base that providers have to engage in standardization activity; additionally, users are not concerned so much with a solution to an IT problem as they are with a solution to a business problem. As a result, the users tend to be less focused on long term IT standards and more focused on the use of standards to provide a solution to business problems, both current and future.

This aspect of standardization - that is, the separation of standardization effort of the providers

and the standardization effort of the users - has, like the change in the standardization model described above, been overlooked in the current writings and theory in standardization. By and large, there is the supposition that the two stage model is applicable, and that there is one big happy (or at least not too contentious) family that is creating standards. Figure 2 shows this approach - with users, providers, and interested parties (government, etc.) combining to create a standard that is then implemented by the users in conjunction with the providers.

As might be suspected, I tend to disagree with this reasonably simple view - hence the five stage model. I would like to move towards a model that I believe describes today's standards environment, and draw some conclusions from the model.

The five stage model, unlike the simpler two stage model, is based upon the belief that standardization, as it is practiced today, has two separate poles - a user implementation side (the right side of the model) and the provider global model (left hand side of the model), separated by a dashed line. The line that separates them is not solid - that is, it does not prohibit the users from moving to the providers side, nor does it prohibit the providers from being viewed as users. However, in the main, there is a distinction between the providers of IT products and services and the users of IT products and services. This distinction, while admittedly artificial at times, is key to the model.

The model gains its first attributes when the nature of standards produced by the two separate forces are examined. There was the contention above that the providers tend to produce global standards to serve all of the potential users of IT products, while users tend to implement specific standards that meet the needs of their particular business model. Figure 2 introduces these concepts - a large box for the global nature of the provider's standard, and a small box to indicate the more focused and precise nature of the user requirements. The relative size of the boxes should not be taken to indicate relative importance, but rather the number of options available in each.

In Figure 3, the boxes are labeled "Reference Model" for the provider box and "Application Implementation" for the user box. Neither is referred to as a standard, since neither one correctly is a standard. The Reference Model, however, does have the properties of an anticipatory standard, in that it is not necessarily focused not upon the present situation, but acts to provide a common base from which standards can be built in a systematic fashion to a common goal. The Application Implementation box, however, displays the attribute of being rooted firmly in the present, and

THE "ONE BIG HAPPY FAMILY" SCHOOL OF STANDARDS

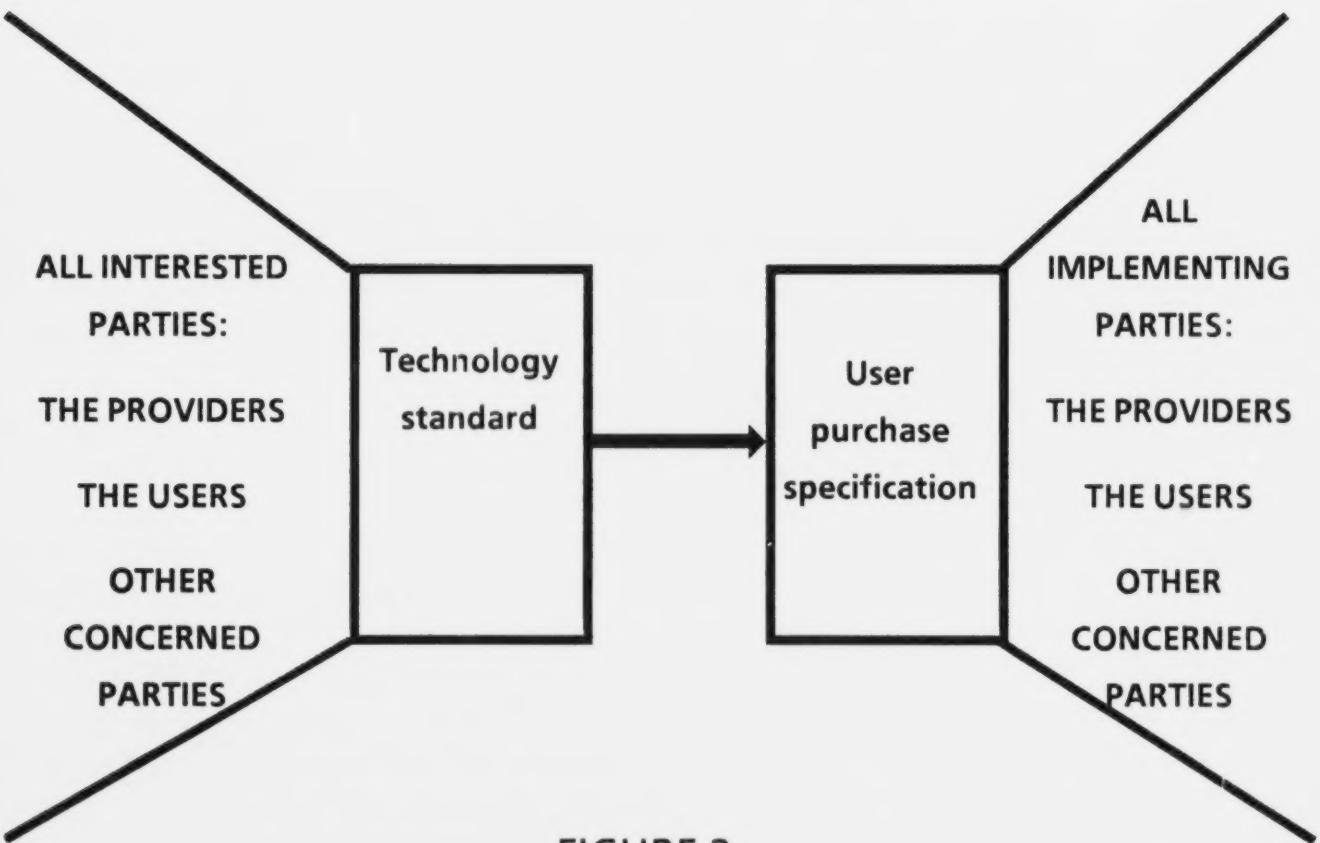
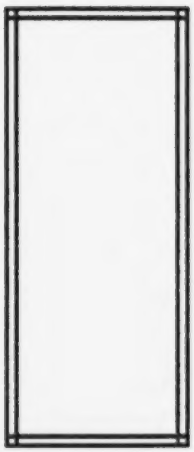


FIGURE 2

THE PROVIDERS OF IT PRODUCTS AND SERVICES

THE USERS OF IT PRODUCTS AND SERVICES

REFERENCE MODEL



APPLICATION IMPLEMENTATION

FIGURE 3

utilizes the currently available offerings to create a user specification which can be used in a contractual situation. This introduces the idea of a time complexity into the model; the Reference Model has a different time orientation than does the Application Implementation. This fact becomes important to the model as it develops.

The two boxes in Figure 3 seem to parallel the two boxes in Figure 1. The differences in time and complexity, however, prevent the two from having any but the slightest congruence, based as they are upon different perceptions of the role of standards. Because of this, it is necessary to provide a bridging mechanism between the two now disparate concepts.

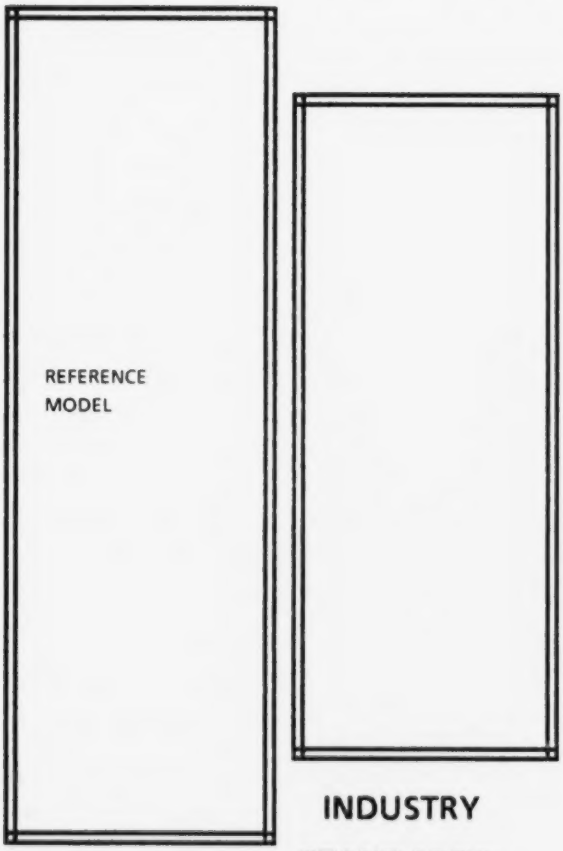
In order to insure that there is an equitable solution, two new boxes will be added (Figure 4). The box immediately to the left of the Implementation Application box is Systems Profile box, and the box to the immediate right of the Reference Model is the Industry Standard box.

The Systems Profile box (portrayed as physically larger than the Implementation Application box) is the higher level of generalization of what a specific user wants. While the Implementation Application box describes what a particular user wants to have in the purchased system, the Systems Profile box describes what the requirements of the groups of similar users are, based upon a standardized set of needs for that group of users. As an example, a Systems Profile would contain an generalized description of the functionality that was being sought, along with the methodology for insuring that generality. The Systems profile can be seen as an additive function from the Implementation Application - that is, a group of Application Implementation requirements were combined to create the Systems Profile for a specific class or type of user. In order to agglomerate the requirements, however, it is necessary to be able to generalize away from a specific implementation of a particular standard into a more generalized standard. In this case, user groups have been formed to write the necessary specifications that describe the ***standardized*** specifications upon which the users will base their individual Implementation Applications. These standardized specifications are the basis for the standards that form the Systems Profiles. In effect, the user group is putting together a list of requirements that providers must meet in order to be able to proceed to the Implementation Application box. Moving from left to right, the Systems Profile box tends to make more global the specific requirements of Implementation Application.

Moving to the other side of the line (to the provider side of the model) there is a new box called Industry Standards. (This box is shown as smaller than the box that portrays the Reference Model.)

THE PROVIDERS OF IT PRODUCTS AND SERVICES

THE USERS OF IT PRODUCTS AND SERVICES



INDUSTRY STANDARDS:

SYSTEMS PROFILES:

FIGURE 4

The Industry Standards box can also be thought of as the "provider standards" box, although the use of this term can be seen as pejorative. Basically, the Industry Standard is an industry implementable subset of the Reference Model. The Reference Model, if it is correctly constructed, includes some present and future technologies, a road map function, and some of the methodologies of the thought processes that occurred when it was constructed. The Industry Standard is the implementation of the strategy contained in the Reference Model. Because it is a standard that is written primarily by the providers of the product or service, it is more focused upon a computing function - that is, how the computing function will occur, rather than what the outcome of the function will be. There is little thought given to the end use (application) here; instead, the various providers input market data through the selection of technologies. That is, the providers create the standard in light of what they see as possible and viable - as well as needed. In the Industry Standard, the providers act for the users in determining the course that the standard will take. Each provider represents their users - and makes implicit and explicit assumptions as to what their user needs will be for the standard, when it is completed. By their lack of participation, most users give providers the proxy vote in deciding what the needs of the IT industry will be in the future.

The implications of this action to the entire standards process are interesting, since it increases the responsibilities and risks to the providers in the standards process. In the discussion of anticipatory standards, there was mention made that the nature of standards had become that of being an industry change agent. By abrogating their participation to the providers, the users have in effect let the providers set the market direction - and if the direction set is not to their liking, they elect to vote with dollars and reject the products that are built with non-needed standards. (The rationale for this statement lies in the fact that standards cost the provider to implement. Costs in standards are recouped through an expanded market, increased sales, or other market mechanisms that rewards the use of standards. If the standard is not used, then there is implicit rejection of the standard and the belief in the future that went into it.)

Even with the addition of these two new areas, there is still no union of the user and provider standards efforts. The Industry Standard is focused on the potentialities that the provider industry sees; the Systems Profile defines the attributes standardized upon by a specific user group. The bridge between these two groups is shown in Figure 5, with the addition of a new box called the Functional Profile. The Functional Profile describes a set of functions that are a subset of the Industry Standard, and which are extracted from the Industry Standard. On the other hand, it

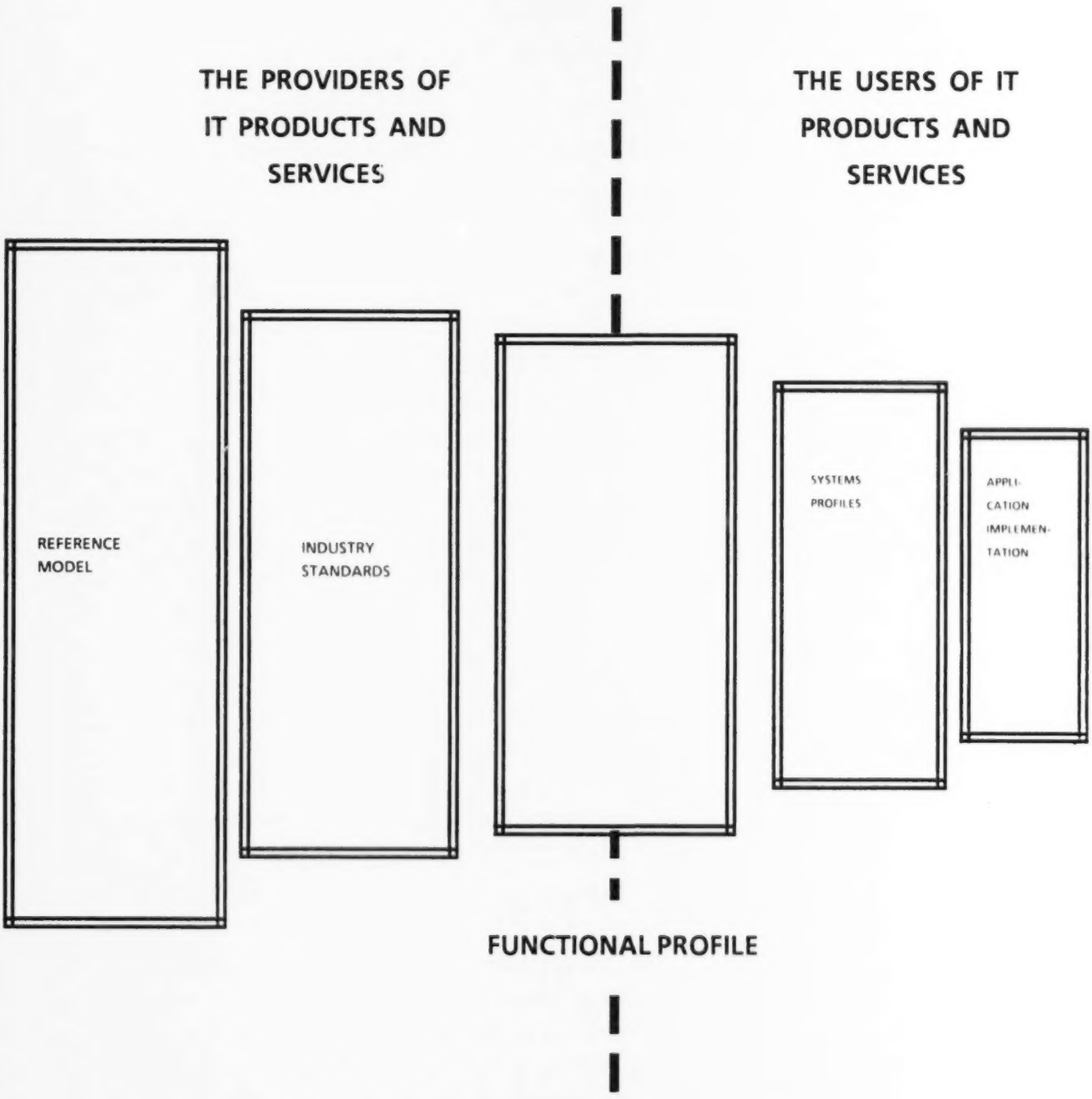

THE PROVIDERS OF IT PRODUCTS AND SERVICES
THE USERS OF IT PRODUCTS AND SERVICES
REFERENCE MODEL
INDUSTRY STANDARDS
SYSTEMS PROFILES
APPLI-CATION IMPLEMEN-TATION
FUNCTIONAL PROFILE

FIGURE 5

describes a set of needed functions for a larger class of users than is described in the more precise Systems Profile. Because it exists on a border between provider perceptions and user needs, it has a somewhat confused existence. Basically, however, it translates the potentiality of an industry's capabilities in a certain area into a set of functions from which the users can begin to construct a more specific system. It is an area of uneasy cooperation between users and providers - that is, it is where the providers discover if they have anticipated user needs correctly, and users find out if what they need is within the scope of what the industry can provide. It is the area where I believe most conflicts will occur in the future - and the area that provides the greatest ability to effect compromises.

With the addition of the Functional Profile, the model is complete. It presents a narrowing as you move from left to right, and a widening as you move from right to left. It presents a neat and reasonably simple picture when viewed as presented in Figure 5.

Unfortunately, the completion of the model is only the start of the attempting to deal with the complexities of the standardization process. The model presents a logical flow - but it is only a simple model. As a representation of a reality for illustration purposes, it offers a structure that will allow further investigation.

Before I go into the complexities that beset the model, there are several key findings that have appeared. To begin, the model can be viewed as a method of describing a time/event horizon in the standards process. The Reference Model occurs on a 10 year event horizon; the Implementation Application appears on an 18 month event horizon. Figure 6 shows the timings of the various other stages of the model. I have not investigated the implications of this aspect of the model; I am not sure what it implies. However, I believe that it has significance for the voluntary consensus standards process, since the event horizon of the Reference Model implies a ten year commitment to see a standard from conception through to implementation. If this is the case, and I believe that it is, it indicates that the reference models will become the premier planning devices for the industry, and will become the change agents for the way that IT evolves. It also says that the possibility of revolution is somewhat diminished, since revolution in a highly planned environment will be increasingly difficult. However, it does not impact the insertion of technologies, nor does it seem to restrict technical innovation, since the reference model does not describe a methodology for implementation.

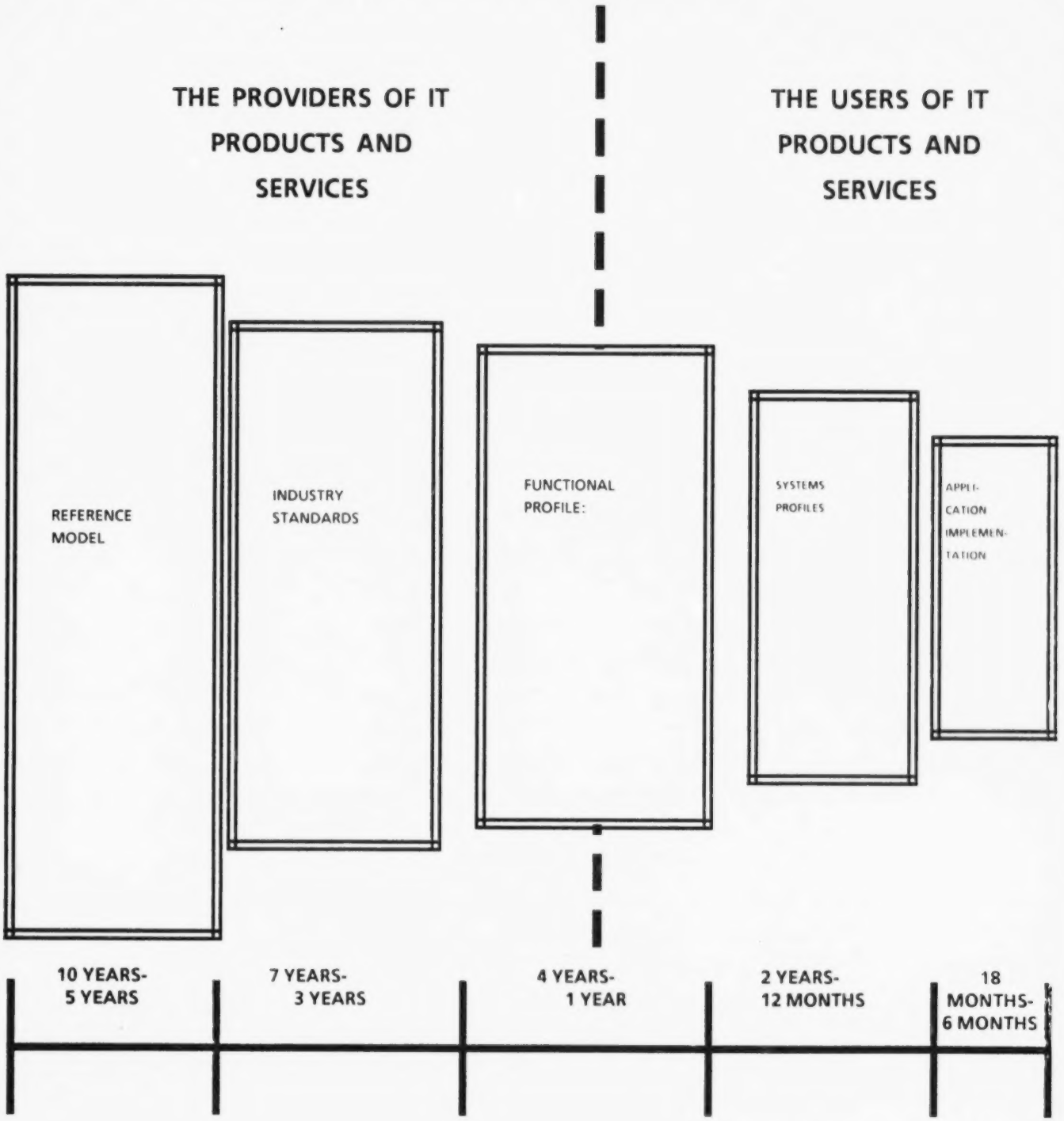

THE PROVIDERS OF IT PRODUCTS AND SERVICES
THE USERS OF IT PRODUCTS AND SERVICES
REFERENCE MODEL
INDUSTRY STANDARDS
FUNCTIONAL PROFILE:
SYSTEMS PROFILES
APPLI-CATION IMPLEMEN-TATION
10 YEARS-5 YEARS
7 YEARS-3 YEARS
4 YEARS-1 YEAR
2 YEARS-12 MONTHS
18 MONTHS-6 MONTHS

FIGURE 6

The next interesting dilemma that I have is the apparent linearity of the model. It is, in fact, not linear. While the assignment of a time line and event horizon appear to make it linear, there is no proof that a Reference Model will precede an Industry Standard, or that an Industry Standard will precede an Systems Profile. While the time line is nice for planning purposes, very few users are aware of their needs ten years in advance. In reality, all that can be said about the applicability of the model is that the market tends to eventually develop into the 5 stage model; the market does not require that the process appear any order. This adds a level of confusion to the model, which makes it somewhat suspect as a precise tool for prognostication, but which can enhance its ability to structure and plan on a larger basis.

Turning to a last major complication, Figure 7 shows the implication of the model from the view of moving from the global to the specific. The Reference Model can be implemented in several Industry Standards; each of these can be can be referenced in several Functional Profiles. Each time that this happens, however, there is less and less of the original feature set transferred to the lower level. Each stage of the model becomes more particular and subsetted. Each Functional Profile can be subsetted to become part of a several Systems Profiles, and each of these can be further subsetted as they become an Implementation Application.

Normally, in a decomposition this is not too difficult a matter since most decompositions are for static environments. However, in the case of standards, it becomes a major horror show very quickly. Standards are revised and updated constantly. Because standards are not monolithic any longer, but rather can have several hundreds of interrelated sections, and are updated as the originating committee sees fit, the ability to determine what the revision level of the various parts and levels of the standard begins to disappear. This then eliminates the ability of the levels below the Industry Standard to insure that they are using the latest revision level of the Industry Standard in their stages. This has ramifications that extend beyond insuring that the latest technology is being used and implemented. The question that surfaces immediately is how, or even if, interoperability can be assured. This investigation falls under the heading of "Conformance Life Cycle", which was one of the topics that originated my interest in the standards model.

While this view is complex enough, it demonstrates a particular bias - that of the provider. If the graphic is reversed, you have an entirely different but equally valid figure - in this case, Figure 8. This is the view from the users perspective. Throughout this discussion, the user's need for

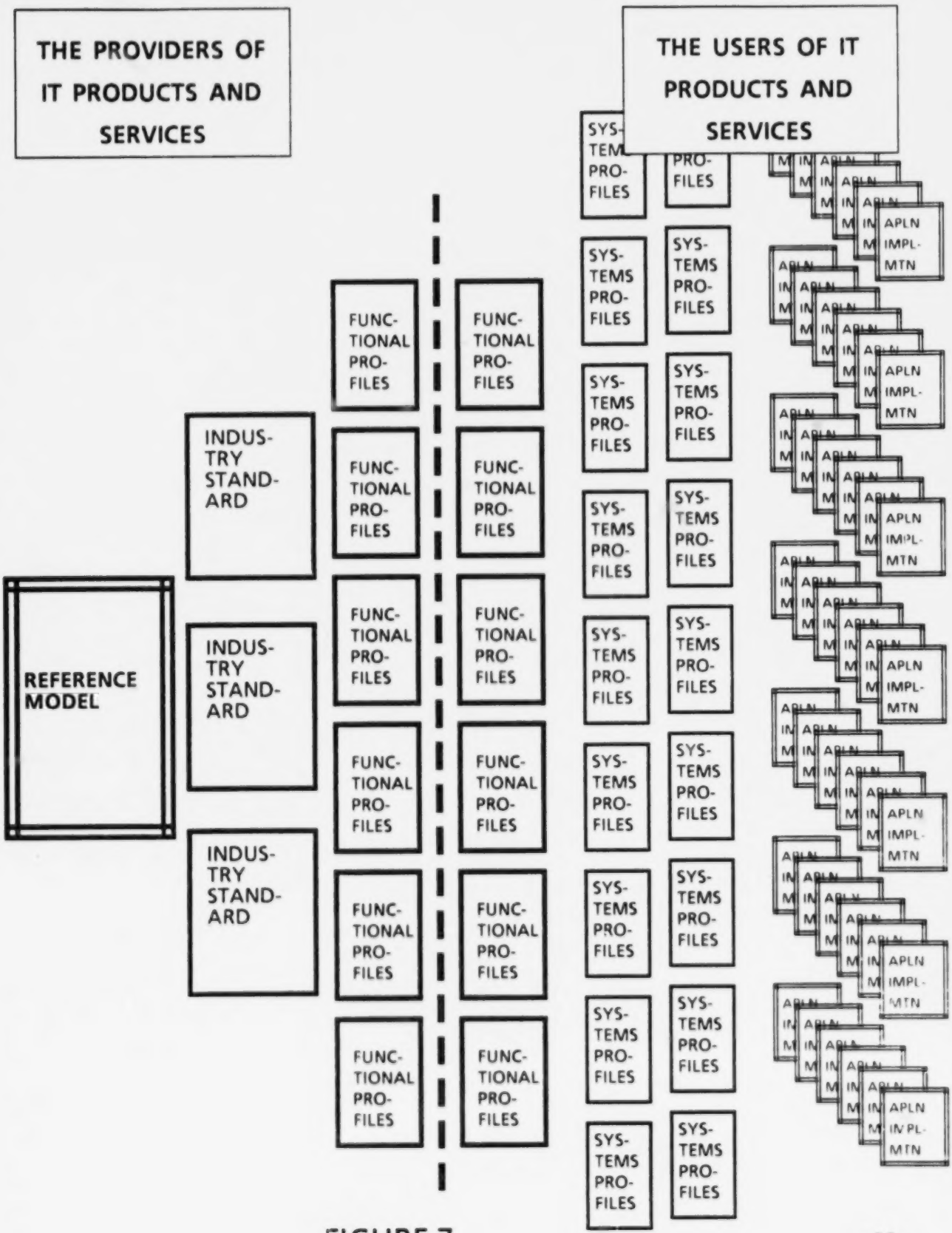

THE PROVIDERS OF IT PRODUCTS AND SERVICES
THE USERS OF IT PRODUCTS AND SERVICES
REFERENCE MODEL
INDUS-TRY STAND-ARD
INDUS-TRY STAND-ARD
INDUS-TRY STAND-ARD
FUNC-TIONAL PRO-FILES
SYS-TEMS PRO-FILES
APLN IMPL-MTN

FIGURE 7

standards have been dealt with in a monolithic fashion - that is, the user only needs IT standards. However, the truth of the matter is that the user is confronted by a multitude of standards - not merely those that deal with IT. The user has IT standards to consider, Telecommunications standards, quality standards, governmental regulations, safety standards, service standards, and reliability standards - to mention just a few - that are all part of the Application Implementation. So, from the user point of view, the Implementation Application appears as the unitary box, with all of the other standards feeding into it.

CONCLUSION

The trouble with modeling something like this is that the model tends to create more problems than it solves. In this case, I was looking for a model upon which to base a "Conformance Life Cycle". The five stage model seemed to be useful for that. Unfortunately, as the description of the model grew, it was necessary to reexamine the nature of the IT standards process, the rationale for the process, and the nature of the industry itself. In many cases, there were leaps of faith - that is, I have made suppositions and assumptions that might be seen as questionable. These suppositions and assumptions, however, are based not upon a need for the assumptions, but rather upon the knowledge that I have of the process as an embedded observer. Since I "do standards" as a career, I tend to be very aware of the undercurrents and trends that occur. Additionally, the network of contacts in the standards industry - both of the old school of standards and the newer "technocrat" school - tend to confirm that this is a time of change.

I believe that the reason for the change is somewhat obvious, in retrospect. Standards have become a tool for marketing - a legitimized area of competitive activity. Because they are so long lived, and because they are practiced on a national and international level, this movement to of standards to a international marketing activity has been very slow and almost unnoticeable. However, they have assumed that position.

Because most U.S. businesses are focused on the short and medium range - that is, the present to 3 year time frame - the activity of standards appears either very slow or non-existent. However, they are a potent weapon in achieving national policy in an international arena. I have seen nations use their diplomatic influence to change standards organizations so that a national interest is secured; similarly, I have seen multinational corporations take on regional governmental organizations and

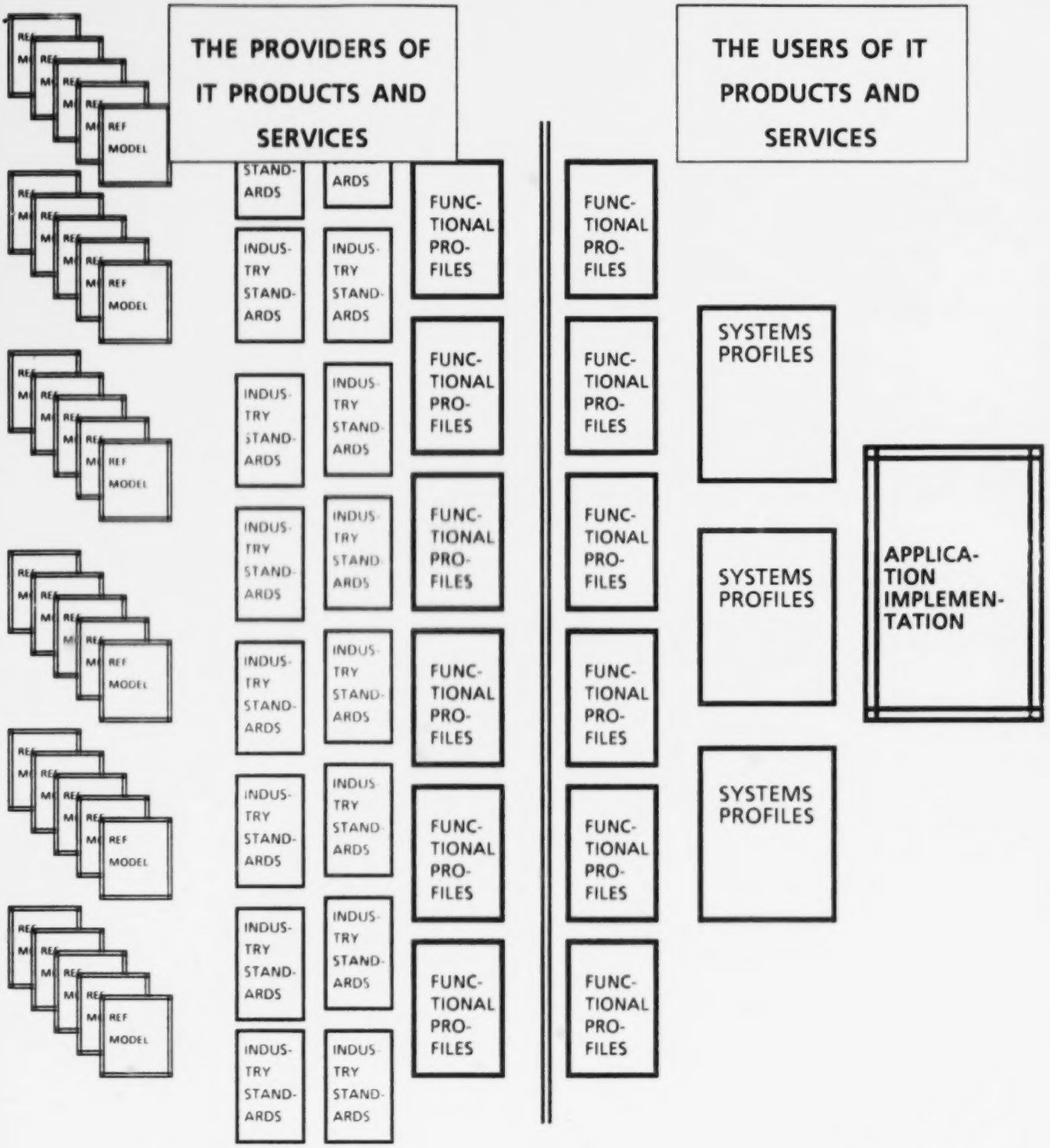

THE PROVIDERS OF IT PRODUCTS AND SERVICES
THE USERS OF IT PRODUCTS AND SERVICES
REF MODEL
INDUS-TRY STAND-ARDS
FUNC-TIONAL PRO-FILES
SYSTEMS PROFILES
APPLICA-TION IMPLEMEN-TATION

FIGURE 8

win. Standards are no longer an interesting technical problem, or an abstract economic concept. Rather, they are potent forces that are changing industries and international trade. They are ponderous and slow, and usually not too interesting to contemplate, but they move with inexorable power.

The same statement, by the way, could be made of glaciers when their movement heralded the beginning of the last Ice Age.

A Five Stage Model for Information Technology Standards:

(or)

Planning would be easy if it wasn't about the future

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OVERVIEW:

- The Advent and Implications of Standards
- The Standards Process
- Anticipatory Standards
- The Five Stage Model
- Conclusion

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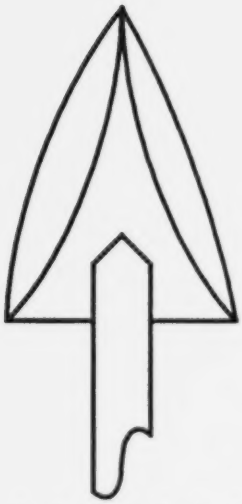
The Implications of Standards



FROM CHOICE OF SPEARHEAD

TECHNICAL DECISION

NON-TECHNICAL IMPLICATIONS OF THE DECISION

TO TYPE OF FOOD

MASTODON AND BIG THINGS

FISH AND WATERFOWL

TO LIFE STYLE

TO WHERE THE WILD THINGS ARE

NEAR RIVERS /SEDENTARY

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THE STANDARDS PROCESS

- The *de jure* standards process is based upon accredited Standards Developing Organizations (SDOs)
- Within the U.S. , the process is voluntary and technically driven
- The process of standards creation occurs in committees, where technologists discuss technologies
- Standards are a marketing tool; the difficulty is reconciling the precise nature of technology with the art of successful marketing.
- SDO activity eventually becomes a study in small group psychology, where random events decide what technology will succeed and which will fail.

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THE PROCESS OF STANDARDS CREATION

- Information Technology (IT) standards are both marketing driven and business based

- The key to IT standards is understanding that they are produced in response to market need, and not in response to technological capability.

- The process of standards creation has five steps

  PRECONCEPTUALIZATION

  FORMAL STAGES

    CONCEPTUALIZATION

    DISCUSSION

    WRITING

  IMPLEMENTATION

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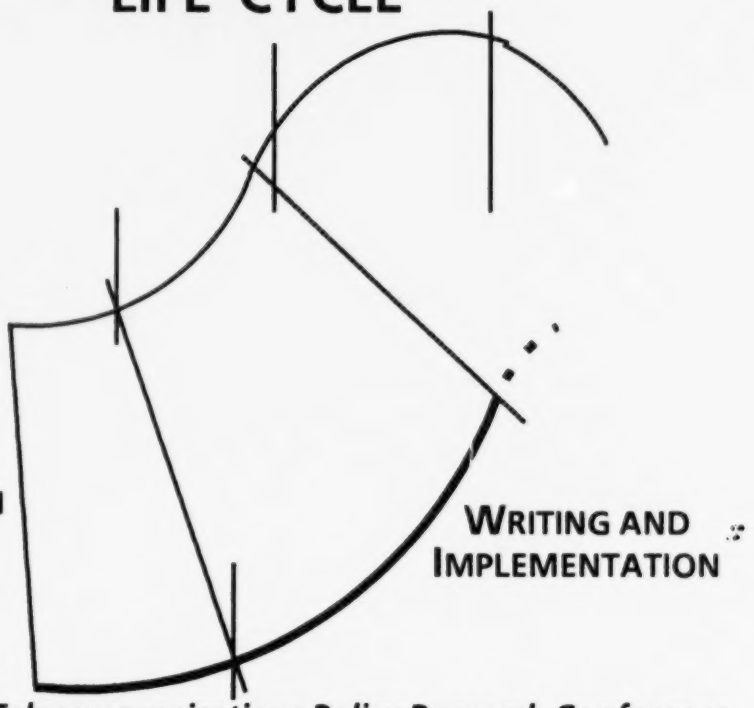
STANDARDS AND MARKETING STRATEGIES

STRATEGY OF CULTURAL CONGRUENCE- COBOL

STRATEGY OF PLANNED CHANGE- LANS

STRATEGY OF UNPLANNED CHANGE - FIBER LANS

THE COLLAPSE OF THE PRODUCT LIFE CYCLE



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ANTICIPATORY STANDARDS

These three factors - the process to create standards, the use of definite marketing strategies, and the collapse of the product life cycle - have all combined to make the outcome of the IT standardization process ANTICIPATORY standards.

These standards will become more and more focused on long range issues, will deal increasingly with boundary layer issues (interface standards), and will be more and more difficult to produce quickly.

Finally, and most importantly, Anticipatory Standards will act as industry change agents, and will be the area where the systems issues, asset portability issues, and interoperability issues will be decided.

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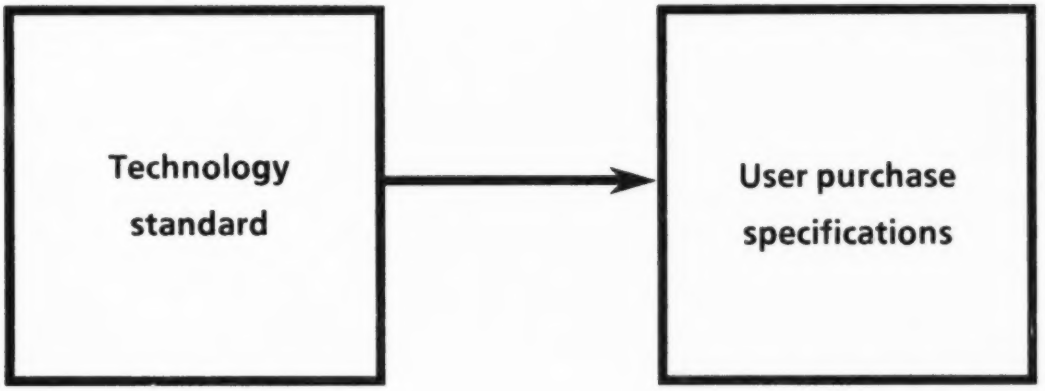
THE FIVE STAGE MODEL OF STANDARDS

THE WAY THAT IT USED TO BE

THE STANDARD

THE USE OF THE STANDARD



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WHAT HAPPENED:

THE MARKET MOVED

- The increase of OEMs who were systems vendors and who needed to put together heterogeneous systems

- The growth of networked computing tied together with telecommunications

- The growth of applications and complexity of applications

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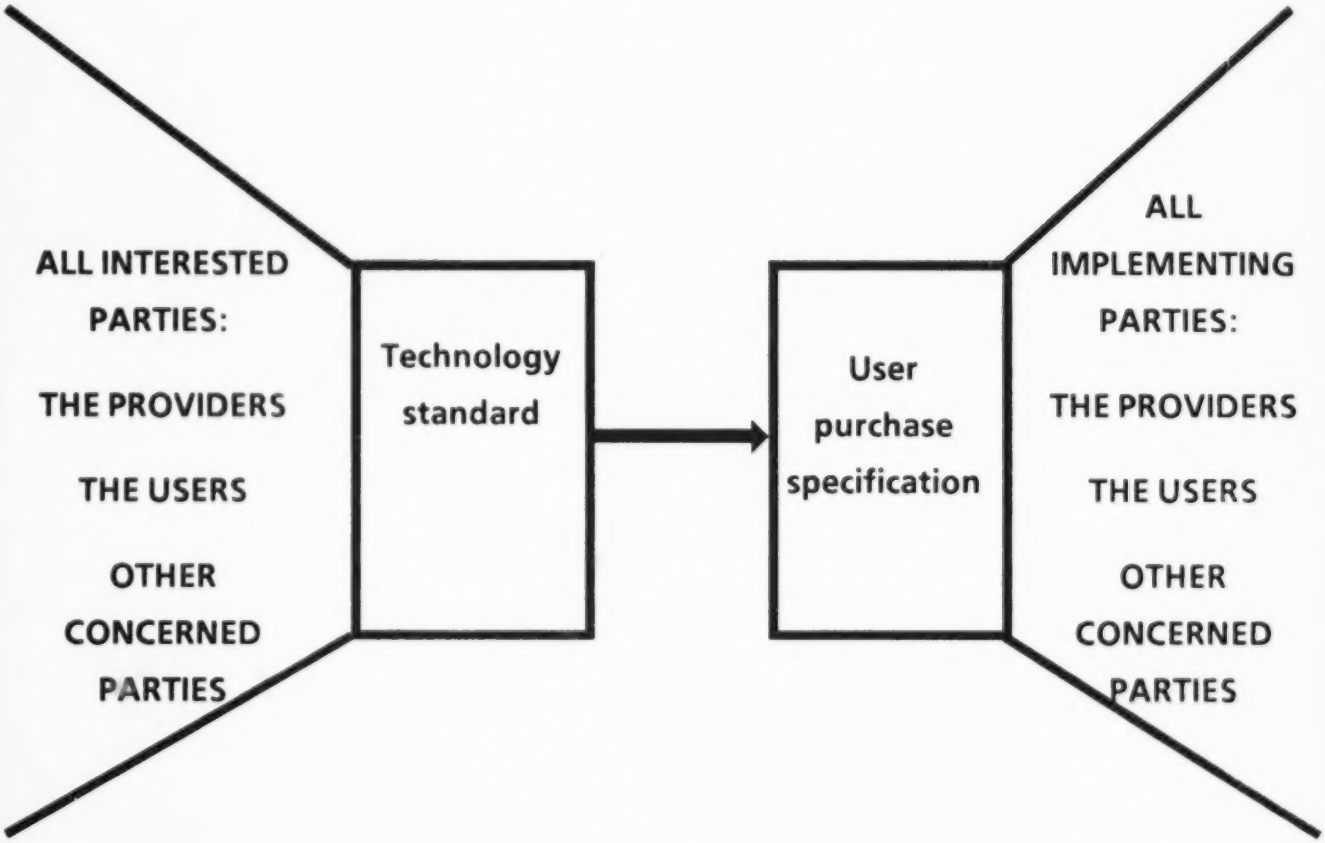
THE "ONE BIG HAPPY FAMILY" SCHOOL OF STANDARDS



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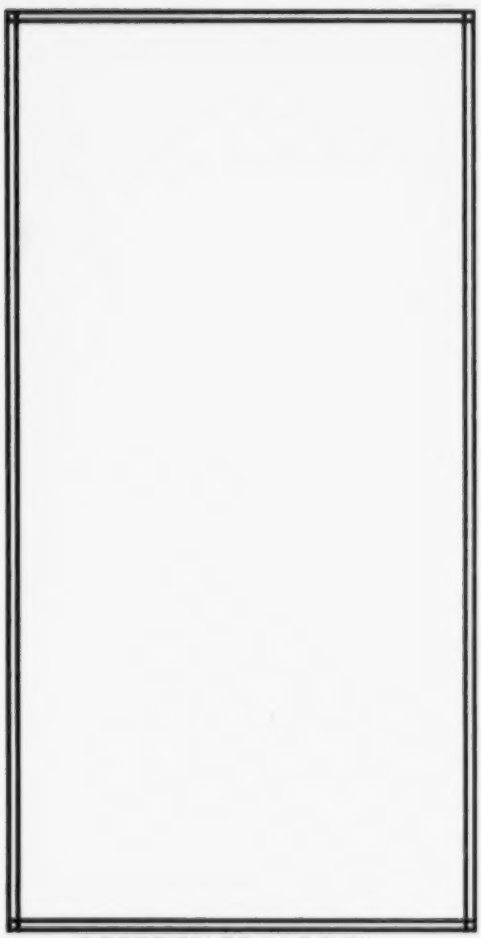
THE PROVIDERS OF IT PRODUCTS AND SERVICES



REFERENCE MODEL

DESCRIBES GLOBALLY HOW THE CONCEPT IS TO FUNCTION *WITHIN THE IT COMMUNITY*

THE USERS OF IT PRODUCTS AND SERVICES

APPLICATION IMPLEMENTATION

APPLICATIONS SPECIFIC TO A USER - CAN BE USED FOR A PURCHASE SPECIFICATION

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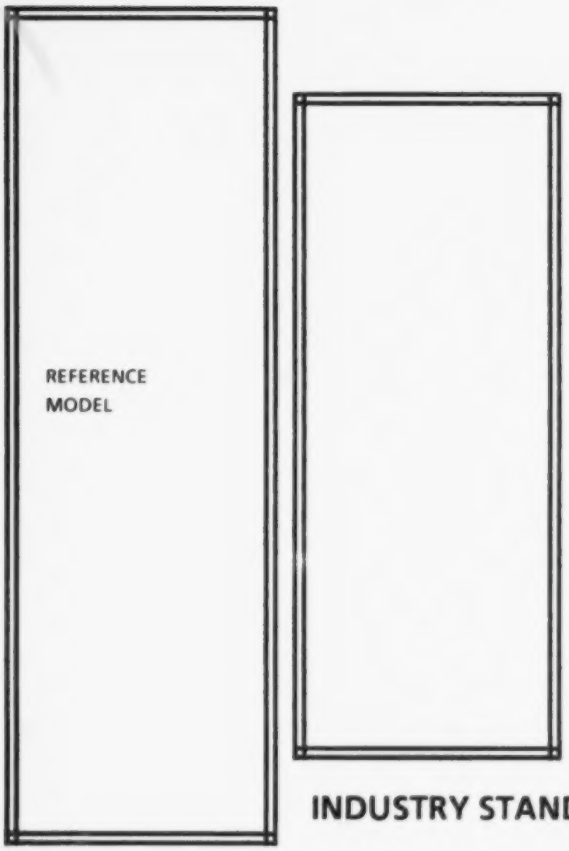
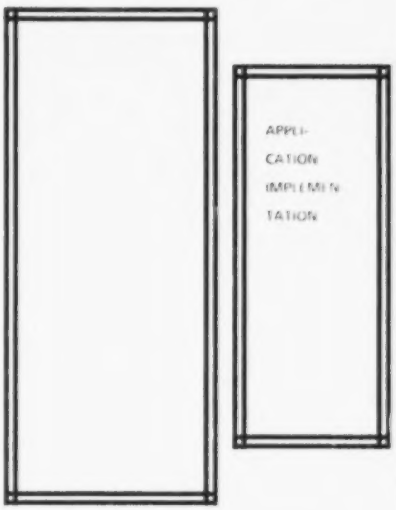
THE USERS OF IT PRODUCTS AND SERVICES





INDUSTRY STANDARD:

IT INDUSTRY IMPLEMENTATION OF A REFERENCE MODEL; FOCUS IS ON THE COMPUTING FUNCTION

SYSTEMS PROFILE:

STANDARDIZED REQUIREMENTS FOR A COLLECTION OF LIKE MINDED USERS

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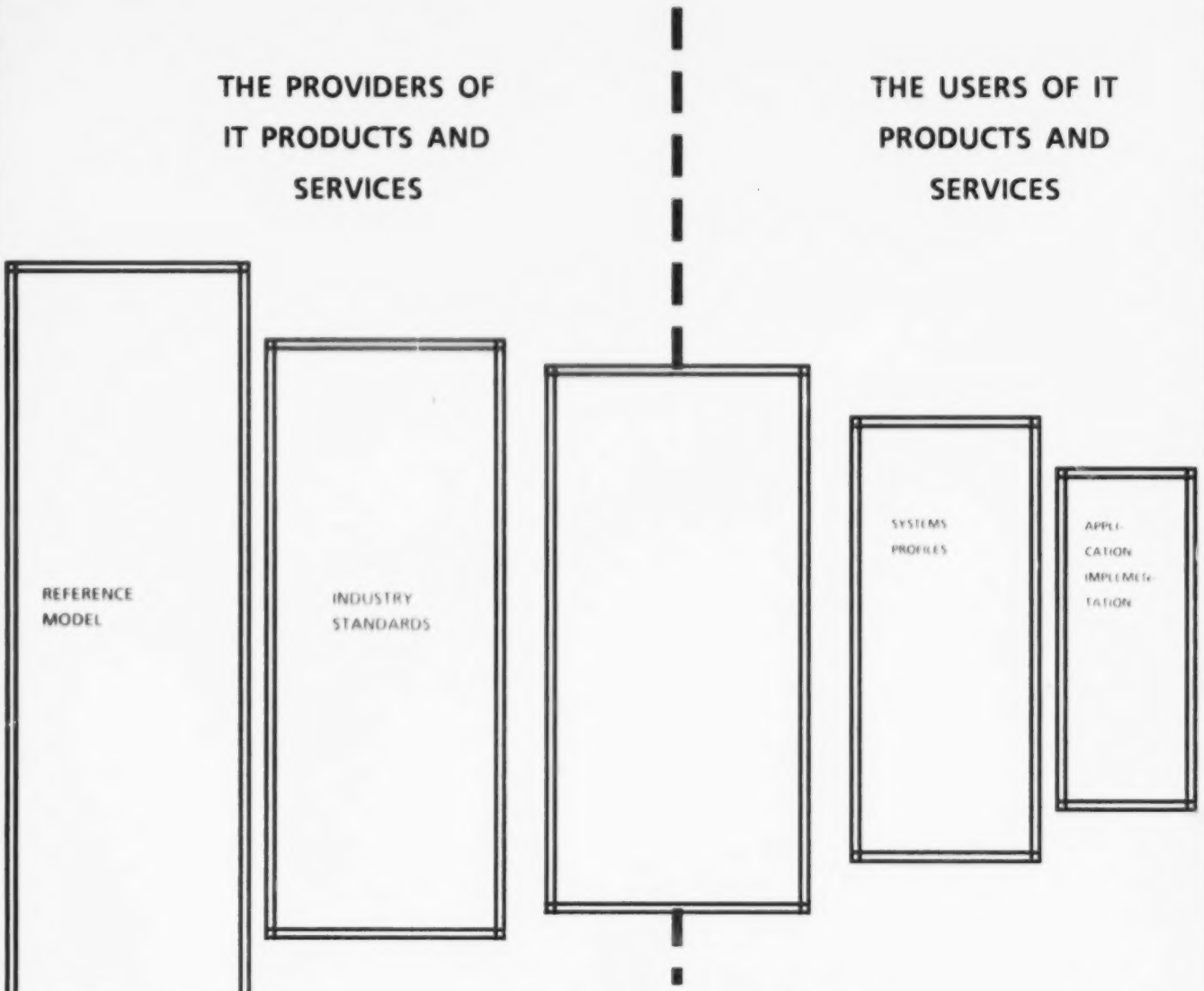

FUNCTIONAL PROFILE:

A GENERALIZED SET OF LIKE FUNCTIONS, MORE SPECIFIC THAN THE INDUSTRY STANDARD BUT GENERAL ENOUGH TO ALLOW A MARKET OPPORTUNITY.

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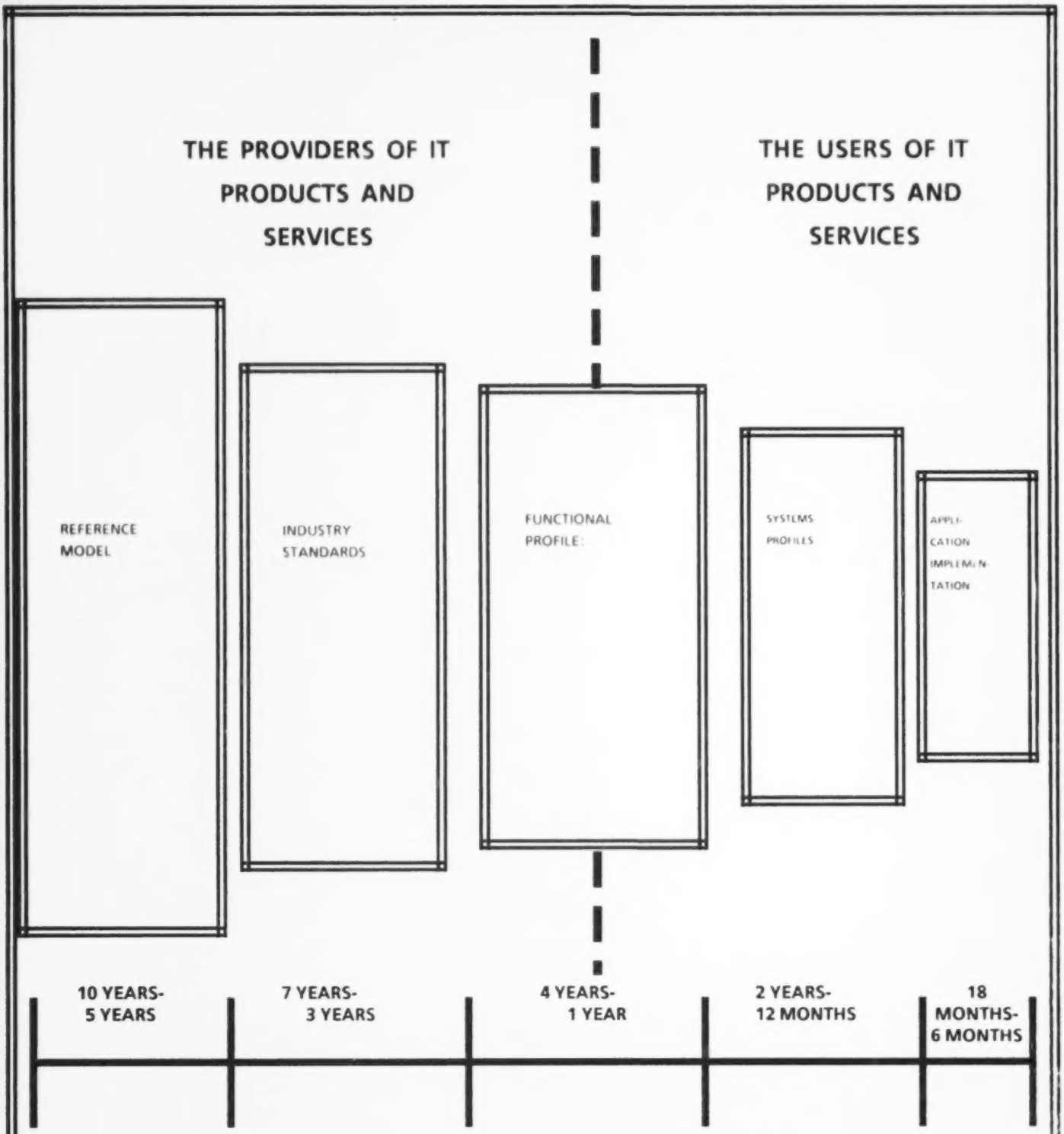

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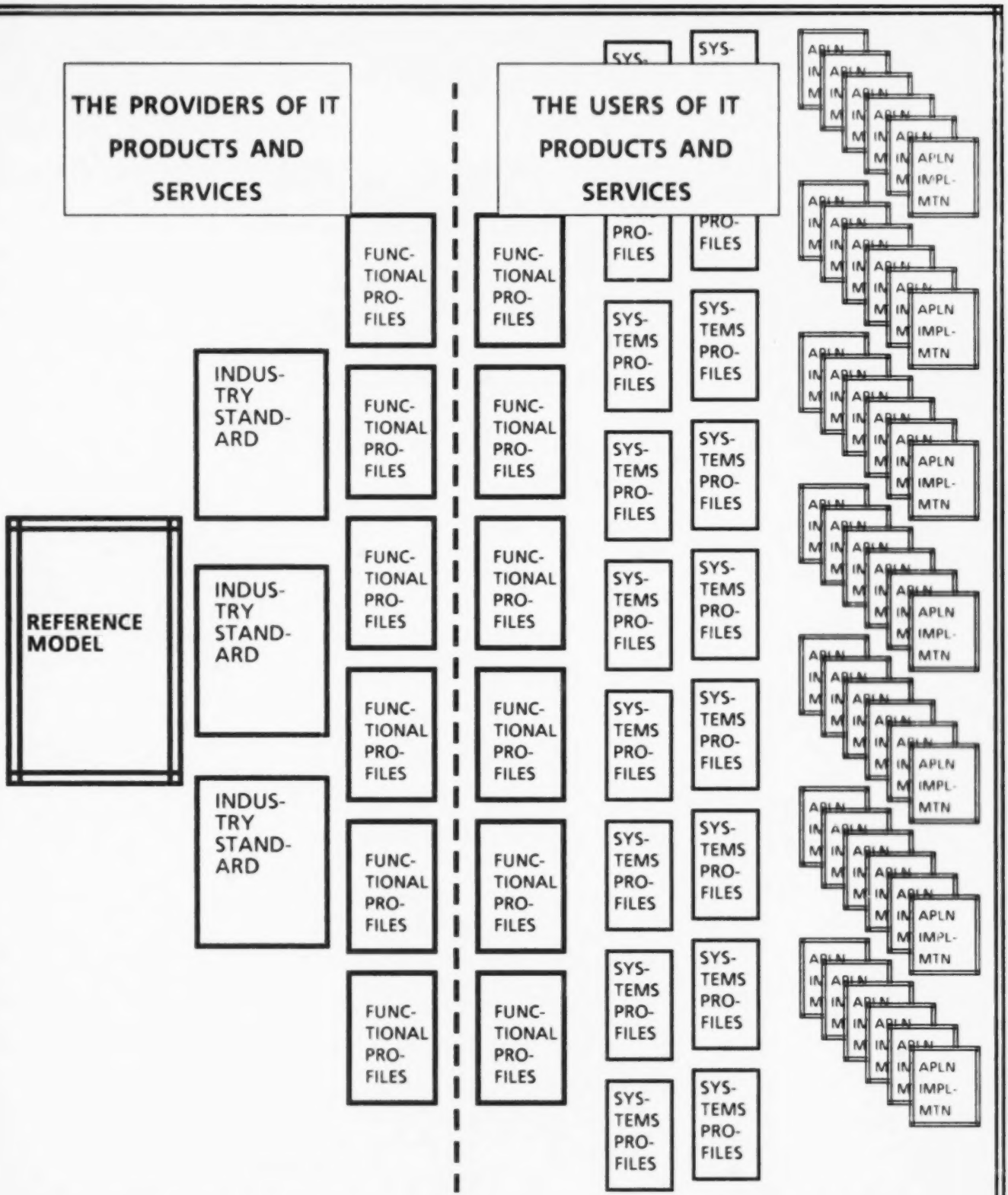

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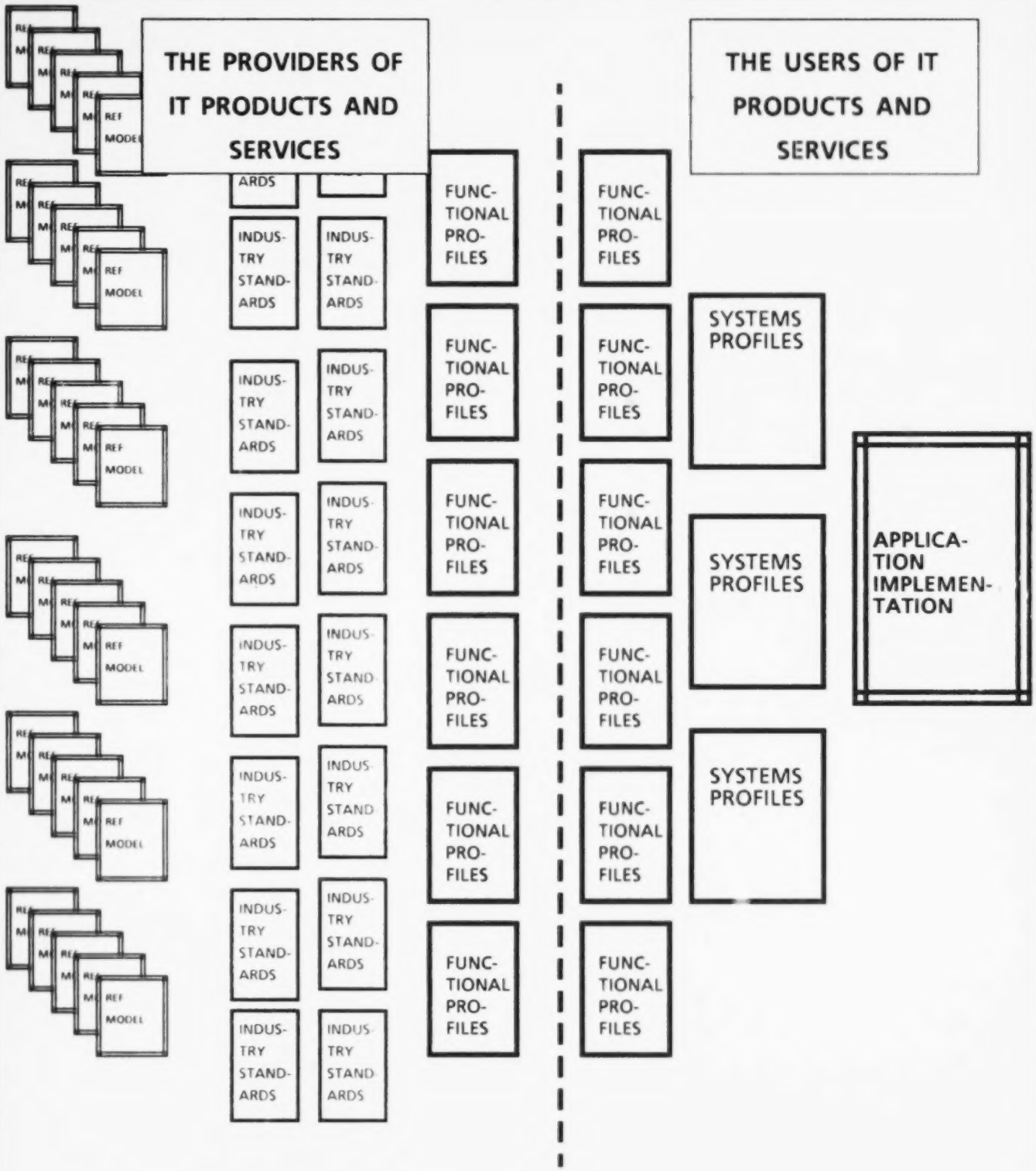

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CONCLUSION

- **Standards are now a marketing tool that can be used by companies, multi-national corporations, national governments, or regional governmental groups to impact the market.**
- **The study of standards - as an applied marketing discipline - has been overlooked in the United States.**
- ***Standards will happen - as will the consequences of standards. Standards are slow, but have demonstrated a capability to change the IT market as few other disciplines can.***

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